

#15
Appeal
Brief
J. McMillan
11/25/02
RECEIVED
NOV 22 2002
TECHNOLOGY CENTER 2000

In re Application of: Yamakawa, et al. : Examiner: Graybill, D.
Serial No.: 09/597,218 : Art Unit: 2827
Filed: 20 June, 2000 : Confirmation No.: 5276
Docket No.: TSL 1549 : Date: 14 November 2002
Title: Adhesive and Semiconductor : Appeal Brief under 37 C.F.R § 1.192
Devices

Real Party in Interest

The real party in interest in this appeal is Dow Corning Toray Silicone Company, Limited, the assignee of the above application.

Related Appeals and Interferences

Appellants are not aware of any related appeals or interferences that will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

Status of Claims

Claims 1-17 were originally filed in this application. Claims 1-17 are pending in this application and were finally rejected in the office action dated 24 July 2002.

Status of Amendments

Appellants replied to a first office action dated 27 March 2002 in an amendment under 37 C.F.R. §1.111 dated 22 April 2002. The Examiner entered this amendment. No other amendments have been submitted subsequent to the final rejection dated 24 July 2002. The appealed claims 1-17 are in Appendix A of this brief.

Summary of the Invention

Appellants' invention relates to an adhesive composition for bonding a semiconductor chip to an attachment member for the chip comprising a curable polymer composition. The curable polymer composition comprises from 1 to 900 weight-ppm spherical filler having an average particle size of from 10 to 100 μ m and a major axis-to-minor axis ratio of from 1 to 1.5. Appellants' invention further relates to semiconductor devices characterized in that a semiconductor chip is bonded to a mounting component thereof by the adhesive (p. 3, line 21 to p. 4, line 4). The spherical filler content in the adhesive is from 1 to 900 weight-ppm based on the weight of the curable polymer composition (p. 5, lines 6-9). It becomes increasingly difficult to obtain a constant chip-to-mounting component gap when the spherical filler content in the

adhesive falls below the above-specified lower limit (p. 5, lines 9-11). At the other extreme, an inability to thoroughly relax the mechanical stresses acting on the semiconductor chip becomes increasingly prominent when the above-specified upper limit is exceeded (p. 5, lines 11-13).

Issues

- (I) Whether claim 3 is rejected by the Examiner.
- (II) Whether claims 12, 14, 15, and 17 are indefinite under 35 U.S.C. §112, second paragraph.
- (III) Whether claims 1, 2, 4, 5, 7, 8, 10, 11, 13, and 16 are obvious over JP 7292343 to Nakayoshi (Nakayoshi) under 35 U.S.C. §103(a).
- (IV) Whether claims 1, 2, 4, 5, 7, 8, 10, 11, 13, and 16 are obvious over the combination of Nakayoshi and U.S. Patent 5,882,467 to Sierawski (Sierawski) under 35 U.S.C. §103(a).
- (V) Whether claims 6 and 9 are obvious over the combination of Nakayoshi and Sierawski under 35 U.S.C. §103(a).

Grouping of Claims

Claims 1-17 are pending in the instant application and are the subject of this appeal. Claims 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 13, and 16 should be grouped together for purposes of this appeal. If a ground of rejection for claim 1 is sustained, then it will be equally applicable to claims 2, 4, 5, 6, 7, 8, 9, 10, 11, 13, and 16. Claim 3 should be grouped separately for purposes of this appeal. Claims 12, 14, 15, and 17 should be grouped together for purposes of this appeal. If a ground of rejection for claim 12 is sustained, then it will be equally applicable to claims 14, 15, and 17.

Argument

Claim 3 should be considered separately from the remaining claims in this appeal because the Examiner provided no grounds of rejection for claim 3. Claims 12, 14, 15, and 17 should be grouped together and considered separately from the remaining claims because the Examiner reversed the rejection of claims 12, 14, 15, and 17 in the office action dated 27 March 2002 and did not further reject claims 12, 14, 15, and 17 in the office action dated 24 July 2002.

(I) Whether claim 3 is rejected by the Examiner.

In the office action dated 27 March 2002, at page 1, the Examiner indicates that claims 1-17 are rejected. However, the Examiner provides no grounds of rejection anywhere in the office

action with respect to claim 3. In the office action dated 24 July 2002, at page 1, the Examiner again indicates that claims 1-17 are rejected. Furthermore, the Examiner provides no grounds of rejection with respect to claim 3 in the office action dated 24 July 2002. No other office actions rejecting claims have been received. Therefore, the Appellants respectfully request that the Examiner's rejection of claim 3 be reversed.

(II) Whether claims 12, 14, 15, and 17 are indefinite under 35 U.S.C. §112, second paragraph.

In the office action dated 27 March 2002, the Examiner rejected claims 12, 14, 15, and 17 under 35 U.S.C. §112, second paragraph, as being indefinite. In the amendment dated 22 April 2002 claim 10 was amended to provide antecedent basis for claims 12, 14, 15, and 17. The Examiner entered this amendment. In the office action dated 24 July 2002, at pages 2-11, the Examiner rejected claims 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 13, and 16. The Examiner appears to have withdrawn the rejection of claims 12, 14, 15, and 17 under 35 U.S.C. §112, second paragraph, in view of the amendment to claim 10 in the Appellants' reply dated 22 April 2002 because the Examiner makes no further rejections of claims 12, 14, 15, and 17 in the office action dated 24 July 2002. Therefore, it is respectfully submitted that claims 12, 14, 15, and 17 stand allowed, and the Appellants respectfully request that the Examiner's rejection of claims 12, 14, 15, and 17 be reversed.

(III) Whether claims 1, 2, 4, 5, 7, 8, 10, 11, 13, and 16 are obvious over JP 7292343 to Nakayoshi (Nakayoshi) under 35 U.S.C. §103(a).

The Examiner rejected claims 1, 2, 4, 5, 7, 8, 10, 11, 13, and 16 as obvious over JP 7292343 to Nakayoshi (Nakayoshi) under 35 U.S.C. §103(a) in both the office action dated 27 March 2002 and the office action dated 24 July 2002. The Examiner argues that Nakayoshi discloses an adhesive composition for bonding a semiconductor chip to an attachment member for the chip comprising a curable polymer composition comprising from 1000 to 1,000,000 weight-ppm spherical filler having an average particle size of from 10 to 100 micrometers and a major axis-to-minor axis ratio of from 1 to 1.5. The Examiner further argues that Nakayoshi discloses that the curable polymer composition can be a curable silicone composition, such as an addition reaction-curable silicone composition. The Examiner admits that Nakayoshi does not disclose the polymer composition comprising from 1 to 900 weight-ppm spherical filler. The

Examiner further argues that Nakayoshi discloses that in a process of manufacturing the adhesive, filler weight-ppm is a result-effective variable. The Examiner concludes that it would have been an obvious matter of design choice ascertainable by routine experimentation to choose the particular claimed filler weight-ppm limitation.

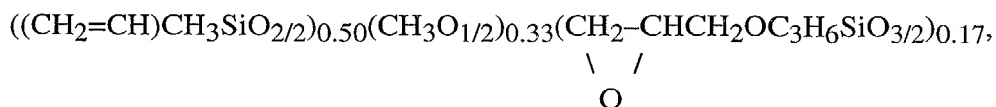
The Examiner further argues in the office action dated 24 July 2002 that a known or obvious composition such as the instant claimed adhesive composition does not become patentable because it has been described as inferior to some other product for the same use. The Examiner further argues that a reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill in the art, including nonpreferred embodiments. The Examiner further argues that a prior art opinion that a claimed invention is not preferred for a particular limited purpose, does not preclude utility of the invention for that or another purpose or even preferability of the invention for another purpose. The Examiner deems Appellant's citation of particular portions of the disclosure to support the contention that the claimed invention provides unexpected results over Nakayoshi unpersuasive because the Examiner argues that unexpected results must be established by factual evidence, and not by mere argument and that arguments of counsel cannot take the place of evidence in the record.

Nakayoshi discloses an adhesive for joining a semiconductor pellet to a semiconductor pellet attachment member, composed of (A) an organopolysiloxane having at least two silicon-bonded alkenyl groups per molecule, (B) an organopolysiloxane having at least two silicon-bonded hydrogen atoms per molecule, (C) an organosilicon compound having a silicon-bonded alkoxy group, (D) an organic or inorganic spherical filler whose particle diameter is 10 to 100 micrometers and whose major/minor axis ratio is 1.0 to 1.5, and (E) a catalytic amount of platinum or a platinum compound (Abstract). The adhesive contains 100 weight parts of component (A). The adhesive contains an amount of component (B) such that there will be 0.5 to 3 mol of silicon-bonded hydrogen atoms in component (B) per mole of silicon bonded alkenyl groups in component (A). The adhesive contains 0 to 10 weight parts of component (C), and 0.1 to 100 weight parts of component (D) (paragraph 6). Nakayoshi discloses that the amount in which component (D) is contained must be between 0.1 and 100 weight parts per 100 weight parts of component (A). If component (D) is contained in an amount less than 0.1 weight part per 100 weight parts of component (A), there will be a pronounced loss of wire bondability to the

semiconductor pellet after the semiconductor pellet and the semiconductor pellet attachment member have been joined by the adhesive (paragraph 21). Nakayoshi does not teach or suggest any curable epoxy resin compositions, curable acrylic resin compositions, or curable polyimide resin compositions in the adhesive. Nakayoshi does not teach or suggest any curable epoxy-modified silicone compositions, curable acrylic-modified silicone compositions, or curable polyimide-modified silicone compositions in the adhesive. Nakayoshi further discloses a semiconductor device characterized in that a semiconductor pellet and a semiconductor pellet attachment member are joined by the cured product of said adhesive (paragraph 7).

One skilled in the art would not be have a reasonable expectation of success to arrive at this invention based on the disclosure of Nakayoshi. Nakayoshi teaches away from this invention because Nakayoshi teaches that to use an amount of filler less than 1000 weight ppm (0.1 weight %) causes a detriment (pronounced loss of wire bondability, as discussed above). One skilled in the art would not be motivated to use less than 1000 weight ppm of filler because if the filler is contained in an amount less than 0.1 weight part per 100 weight parts of component A, there will be a pronounced loss of wire bondability to the semiconductor pellet after the semiconductor pellet and the semiconductor pellet attachment member have been joined by the adhesive containing the filler. Therefore, one skilled in the art would not be motivated to use an amount of filler less than 1000 weight ppm based on the disclosure of Nakayoshi.

Furthermore, this invention provides unexpected results over the disclosure of Nakayoshi. Example 1 and Comparative Example 2 illustrate the unexpected results. In Example 1, an adhesive was prepared by mixing the following to homogeneity: 100 weight parts dimethylvinylsiloxo-*endblocked* dimethylpolysiloxane, 1.5 weight parts trimethylsiloxo-*endblocked* methylhydrogenpolysiloxane, 1 weight part organopolysiloxane with the average unit formula



0.1 weight part of a 1 weight% isopropanolic chloroplatinic acid solution, 0.05 weight part (this addition gave 500 weight-ppm in the adhesive) of a spherical silica micropowder with an average

particle size of 40 μm (standard deviation on the particle size distribution = 3 μm) and an aspect ratio of 1.05, 0.01 weight part 3-phenyl-1-butyne-3-ol, and 2 weight parts fumed silica (average particle size = 30 nm , BET specific surface area = 200 m^2/g) whose surface had been treated with hexamethyldisilazane. When heated for 30 minutes at 150°C, this adhesive produced a silicone rubber that gave a value of 30 for the type A durometer specified in JIS K-6253. Semiconductor devices were fabricated using the adhesive, and after 3,000 cycles, the defect rate was 0%.

In Comparative Example 2, an adhesive was prepared as in Example 1, but in this case using 157 weight parts (this addition corresponded to 60 weight% in the adhesive) of the spherical silica micropowder that was employed in Example 1. When heated for 30 minutes at 150°C, this adhesive produced a silicone rubber that gave a value of 48 for the type A durometer specified in JIS K-6253. Semiconductor devices were fabricated using the adhesive, and after 3,000 cycles, the defect rate rose to 55%.

With respect to the Examiner's additional arguments in the office action dated 24 July 2002, the claimed invention is not obvious over Nakayoshi because Nakayoshi teaches that to use an amount of filler less than 1000 weight ppm (0.1 weight %) causes a detriment (pronounced loss of wire bondability). Compositions having an amount of filler less than 1000 weight ppm are not enabled by the disclosure of Nakayoshi because Nakayoshi teaches that the composition cannot have an amount of filler less than 1000 weight ppm. In contrast, the composition of this invention does not contain more than 900 weight ppm of filler. Therefore, the composition of this invention is outside the scope of the composition of Nakayoshi and the compositions of this invention and of Nakayoshi cannot overlap because the ranges for the amounts of filler differ. Furthermore, the Appellants respectfully submit that they have established unexpected results by factual evidence as described with respect to Example 1 and Comparative Example 2, already of record in the specification, because Example 1 and Comparative Example 2 show an unexpected benefit by decreasing the amount of filler outside the range required by Nakayoshi and into the range of this invention.

This invention is not obvious over Nakayoshi because Nakayoshi teaches away from this invention and the amount of filler disclosed in this invention provides unexpected results over

Nakayoshi. The Appellants request that rejection of claims 1, 2, 4, 5, 7, 8, 10, 11, 13, and 16 under 35 U.S.C. §103(a) be reversed and the claims allowed to issue.

(IV) *Whether claims 1, 2, 4, 5, 7, 8, 10, 11, 13, and 16 are obvious over the combination of Nakayoshi and U.S. Patent 5,882,467 to Sierawski (Sierawski) under 35 U.S.C. §103(a).*

In both the office action dated 27 March 2002 and the office action dated 24 July 2002, the Examiner rejected claims 1, 2, 4, 5, 7, 8, 10, 11, 13, and 16 under 35 U.S.C. §103(a) as being unpatentable over Nakayoshi in view of Sierawski for the reasons discussed above for Nakayoshi and because Sierawski discloses an adhesive polymer composition comprising less than about 20 weight percent filler. The Examiner further argues that it would have been obvious to combine the product of Sierawski with the product of Nakayoshi because it would provide a filler. The Examiner further argues in the office action dated 24 July 2002 that a known or obvious composition such as the instant claimed adhesive composition does not become patentable because it has been described as inferior to some other product for the same use. The Examiner further argues that a reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill in the art, including nonpreferred embodiments. The Examiner further argues that a prior art opinion that a claimed invention is not preferred for a particular limited purpose, does not preclude utility of the invention for that or another purpose or even preferability of the invention for another purpose. The Examiner deems Appellant's citation of particular portions of the disclosure to support the contention that the claimed invention provides unexpected results over Nakayoshi unpersuasive because the Examiner argues that unexpected results must be established by factual evidence, and not by mere argument and that arguments of counsel cannot take the place of evidence in the record. The Examiner further argues that selection of an art recognized element based on its suitability for its intended use supports a prima facie obviousness determination and that therefore, selection of the spherical filler of Sierawski to make an adhesive polymer composition of a type made of spherical filler as taught by Nakayoshi would have been obvious.

The disclosures of Nakayoshi and this invention are as discussed above. Sierawski discloses a curable organosiloxane composition comprising (A) a polyorganosiloxane containing at least two alkenyl radicals per molecule, (B) an amount sufficient to cure said composition of an organohydrogensiloxane containing at least two silicon-bonded hydrogen atoms per molecule,

where the sum of the alkenyl radicals per molecule of (A) and the silicon-bonded hydrogen atoms per molecule of (B) is greater than 4, (C) an amount sufficient to promote curing of said composition of a hydrosilation catalyst, and (D) an amount sufficient to impart adhesion to cured articles prepared from said composition of 1) an epoxide compound, 2) an organosilicon compound, 3) a chelated aluminum compound derived from a 1,3-diketone; and (E) an amount sufficient to impart flame retardancy to said composition of an additive comprising at least one compound selected from the group consisting of hydrated aluminum oxide and magnesium hydroxide (col. 2, line 60 to col. 3, line 18). Sierawski discloses that fillers such as silica can be added to the composition (col. 8, lines 52-59). Sierawski discloses that compositions containing less than about 20 weight percent of fillers are particularly useful as adhesives (col. 10, lines 34-40).

One skilled in the art would not be motivated to combine the disclosures of Nakayoshi and Sierawski. Nakayoshi requires that component (D) must be spherical; the major/minor axis ratio of component (D) must be between 1.0 and 1.5 (paragraph 20). Based on the disclosure of Sierawski, one skilled in the art would not know which, if any, fillers would be suitable to use in the composition of Nakayoshi. Silica is the only filler exemplified by Sierawski (col. 8, lines 52-67).

In Example 2 of Nakayoshi, a curable composition is prepared containing 1.1 weight parts of polystyrene beads with a diameter of 20 micrometers (standard deviation of bead diameter distribution: 1.2 micrometers) and a major/minor axis ratio of 1.06. A semiconductor device produced using the cured product of the composition as adhesive had a malfunction rate of 0/50. In Comparative Example 2 of Nakayoshi, a composition was prepared as in Example 1 except that 15 weight parts of amorphous silica fines with a particle diameter of 40 micrometers and a particle diameter distribution of 3 to 100 micrometers was used instead of the polystyrene beads. A semiconductor device produced using the cured product of the composition as adhesive had a malfunction rate of 50/50. Silica is the only filler exemplified by Sierawski (col. 8, lines 52-67). Finely divided forms of silica are preferred by Sierawski (col. 8, lines 60-61). Therefore, Nakayoshi teaches away from Sierawski.

The Patent Office must identify where the prior art provides a motivating suggestion to make the necessary modifications (In re Jones, 21 U.S.P.Q. 2d 1941, Fed. Cir. 1992). The

Examiner argues that it would have been obvious to combine the product of Sierawski with the product of Nakayoshi because it would provide a filler. However, the mere fact that the prior art may be modified as suggested by the Examiner does not make the modification obvious unless the prior art suggests the desirability of the modification (In re Fritch, 23 U.S.P.Q. 2d 1780, Fed. Cir. 1992). Here, Nakayoshi already discloses a filler with specific properties, as discussed above. This filler provides specific benefits, including preserving wire bondability of a semiconductor pellet after the semiconductor pellet has been joined to a semiconductor pellet attachment member (paragraph 20). One skilled in the art would not be motivated to remove component (D) of Nakayoshi and replace it with a filler of Sierawski because nothing in the disclosure of Sierawski teaches or suggests that this would provide a benefit over the filler already disclosed by Nakayoshi as component (D). Nothing in the disclosure of Sierawski teaches or suggests that removing the required component (D) of Nakayoshi and replacing it with a filler of Sierawski would improve preserving wire bondability of a semiconductor pellet after the semiconductor pellet has been joined to a semiconductor pellet attachment member. Furthermore, Example 2 and Comparative Example 2 of Nakayoshi suggest that removing required component (D) and replacing it with another filler such as the silica disclosed by Sierawski would destroy a benefit provided by component (D).

Furthermore, even if one skilled in the art did combine the disclosures of Nakayoshi and Sierawski, this would not provide a reasonable expectation of success to arrive at this invention because the adhesive composition of this invention comprises a curable polymer composition comprising from 1 to 900 weight-ppm spherical filler. The spherical filler has an average particle size of from 10 to 100 μm and a major axis-to-minor axis ratio of from 1 to 1.5. This invention further relates to semiconductor devices. Sierawski does not teach or suggest the particle size range of the filler. In contrast, in this invention the average particle size of this spherical filler should be between 10 and 100 μm . The basis for this range is as follows. The generation of a constant gap between the semiconductor chip and its mounting component becomes highly problematic in the case of adhesive that uses spherical filler with an average particle size below 10 μm . At the other extreme, the use of spherical filler with an average particle size exceeding 100 μm is undesirable when the generation of an overly large chip-to-mounting component gap is undesirable (p. 4, lines 5-13). Sierawski does not teach or suggest the major axis-to-minor axis

ratio of from 1 to 1.5. In contrast, in this invention the aspect ratio of the spherical filler under consideration is within the range from 1 to 1.5. It becomes increasingly difficult to generate a constant chip-to-mounting component gap in the case of adhesive that uses spherical filler whose aspect ratio exceeds the given upper limit (p. 4, lines 13-17). Sierawski does not teach or suggest that the adhesive contains 1 to 900 weight-ppm spherical filler. In contrast, this in this invention it becomes increasingly difficult to obtain a constant chip-to-mounting component gap when the spherical filler content in the adhesive falls below the above-specified lower limit. At the other extreme, an inability to thoroughly relax the mechanical stresses acting on the semiconductor chip becomes increasingly prominent when the above-specified upper limit is exceeded (p. 5, lines 6-13).

With respect to the Examiner's additional arguments in the office action dated 24 July 2002, the claimed invention is not obvious over Nakayoshi because Nakayoshi teaches that to use an amount of filler less than 1000 weight ppm (0.1 weight %) causes a detriment (pronounced loss of wire bondability). Therefore, Nakayoshi suggests that the composition cannot have an amount of filler less than 1000 weight ppm. In contrast, the composition of this invention does not contain more than 900 weight ppm of filler. Therefore, the composition of this invention is outside the scope of the composition of Nakayoshi and the ranges for the amount of filler of this invention and of the disclosure of Nakayoshi cannot overlap. Furthermore, the Appellants respectfully submit that they have established unexpected results by factual evidence as described with respect to Example 1 and Comparative Example 2, already of record in the specification, and as discussed above.

One skilled in the art would not be have a reasonable expectation of success to arrive at this invention based on the disclosures of Nakayoshi and Sierawski because Nakayoshi teaches away from this invention, as discussed above, there is no motivation to combine the disclosures of Nakayoshi and Sierawski, and one skilled in the art would not have a reasonable expectation of success to arrive at this invention by replacing the filler of Nakayoshi with the filler of Sierawski, as discussed above. Therefore, the present invention is not obvious over Nakayoshi in view of Sierawski. The Appellants request that the rejection of claims 1, 2, 4, 5, 7, 8, 10, 11, 13, and 16 under 35 U.S.C. §103(a) be reversed and the claims allowed to issue.

(V) *Whether claims 6 and 9 are obvious over the combination of Nakayoshi and Sierawski under 35 U.S.C. §103(a).*

The Examiner rejected claims 6 and 9 under 35 U.S.C. §103(a) as being unpatentable over Nakayoshi in view of Sierawski for the reasons discussed above for claim 1 and because Sierawski discloses a curable polymer composition that is a curable epoxy resin composition comprising a filler with a specific surface area. The Examiner concludes that it would have been obvious to combine the product of Sierawski with the product of Nakayoshi because it would provide a polymer composition and a filler.

This invention is not obvious over Nakayoshi in view of Sierawski for the reasons discussed above for claims 1, 2, 4, 5, 7, 8, 10, 11, 13, and 16, and therefore this rejection is moot. The Appellants request that the rejection of claims 6 and 9 under 35 U.S.C. §103(a) be reversed and the claims allowed to issue.

Based on the above arguments, the Appellants respectfully request that the Examiner's rejections of claims 1-17 of the present application be reversed and that the claims be allowed.

Respectfully Submitted,
DOW CORNING CORPORATION



Catherine U. Brown
Attorney for Appellants
Reg. No. 44,565
2200 West Salzburg Road
Mail Code C01232
Midland, Michigan 48686-0994
(989) 496-1725

Appendix A: Claims

1. An adhesive composition for bonding a semiconductor chip to an attachment member for the chip comprising a curable polymer composition comprising from 1 to 900 weight-ppm spherical filler having an average particle size of from 10 to 100 μm and a major axis-to-minor axis ratio of from 1 to 1.5.
2. The adhesive composition of Claim 1, where the spherical filler has a particle size distribution with a standard deviation that does not exceed 10% of the average particle size of the filler.
3. The adhesive composition of Claim 1, where the curable polymer composition comprises from 1 weight-ppm to 700 weight-ppm spherical filler.
4. The adhesive composition of Claim 1, where the spherical filler is an inorganic spherical filler.
5. The adhesive composition of Claim 1, where the curable polymer composition is a curable silicone composition.
6. The adhesive composition of Claim 1, where the curable polymer composition is a curable epoxy resin composition.
7. The adhesive composition of Claim 1, where the spherical filler has a major axis-to-minor axis ratio of from 1.0 to 1.1.
8. The adhesive composition of Claim 1, where the curable polymer composition is an addition reaction-curable silicone composition.
9. The adhesive composition of Claim 1 further comprising a thixotropic agent selected from the group consisting of organic resin powder, metal powder, and inorganic powder where

the thixotropic agent has an average particle size of 100 μm or less and a specific surface area of 50 to 500 m^2/g .

10. (amended) A semiconductor device comprising a semiconductor chip bonded to an attachment member for the chip by an adhesive composition comprising a curable polymer composition comprising from 1 to 900 weight-ppm spherical filler having an average particle size of from 10 to 100 μm and a major axis-to-minor axis ratio of from 1 to 1.5.

11. The semiconductor device according to Claim 10, where the spherical filler has a particle size distribution with a standard deviation that does not exceed 10% of the average particle size of the filler.

12. The semiconductor device according to Claim 10, where the curable polymer composition comprises from 1 weight-ppm to 700 with-ppm spherical filler.

13. The semiconductor device according to Claim 10, where the spherical filler is an inorganic spherical filler.

14. The semiconductor device according to Claim 10, where the curable polymer composition is a curable silicone composition.

15. The semiconductor device according to Claim 10, where the curable polymer composition is a curable epoxy resin composition.

16. The semiconductor device according to Claim 10, where the spherical filler has a major axis-to-minor axis ratio of from 1.0 to 1.1.

17. The semiconductor device according to Claim 10, where the curable polymer composition is an addition reaction-curable silicone composition.